



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/680,960	10/07/2003	Howard Ge	34261-8500	6075
21611 7590 11/16/2007 SNELL & WILMER LLP (OC) 600 ANTON BOULEVARD SUITE 1400 COSTA MESA, CA 92626			EXAMINER CHACKO DAVIS, DABORAH	
			ART UNIT 1795	PAPER NUMBER
			MAIL DATE 11/16/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/680,960	Applicant(s) GE ET AL.	
	Examiner Daborah Chacko-Davis	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on RCE filed on 08/31/2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 8-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 8-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 12, is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Claim 12, at line 6, recites the limitation "the first rinsing". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-2, 4, 8-10, and 22-23, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of U. S. Patent Application Publication No. 2002/0088393 (Kitano et al., hereinafter referred to as Kitano) and U. S. Patent No. 4,422,904 (Wilkinson).

Raguin, in the abstract, in [0007], [0008], [0009], [0010], [0035], [0039], [0040],

[0041], [0052], [0053], discloses rotating a substrate and spray coating at an angle to the surface of the substrate (see figure 6E) a positive-tone or a negative-tone photoresist solution the surface of the substrate (to obtain deep etched structures at least 15 μ , or greater than 50 μ), and moving the spray nozzle across the substrate surface (diameter) so as to ensure a thick photoresist film spread across the substrate surface uniformly. Raguin, in [0036], discloses that the photosensitive material concentration (in the solution) and the viscosity can be adjusted to obtain the desired thickness of the resist film. Raguin, in [0009], and [0038], discloses that the soft baking process is performed at optimal conditions such that residual solvents do not remain in the photoresist film i.e., the solvent in the photoresist solution coated layer is inherently highly volatile that the photoresist itself. Raguin, in [0053], and in figure 6(e) discloses that the photoresist can be spray coated at an angle less than 90 degrees. Raguin, in [0033], discloses that the substrate is cleaned (primed) with suitable solvents, acid solutions (contact angle less than 90°) etc., so as to improve adhesiveness i.e., the surface is hydrophilic i.e., the surface has a contact angle less than 90 degrees (acute angle, less than 90 degree contact angle includes 40 – 50 degrees), prior to the spray coating of the photoresist solution (claims 1-2, 9-10). The difference between the claims and Raguin is that Raguin does not disclose that the spray nozzle is moved at varying speeds across the substrate. Raguin does not disclose the photoresist to solvent ratio (part of claims 4, and 8) and the claimed viscosity range.

Kitano, in paragraph no. [0125], and in figure 3, and 17B, discloses that the nozzle is moved across the diameter of the substrate at varying speeds. Kitano, in

[0075], [0077], [0079, [0083], discloses that the ratio of the resist to the solvent (with at least 5% solid content) is varied to a range of values so as to keep the viscosity constant. Kitano, in [0138], [0139], and in [0160], and in figure 29, discloses that the viscosity of the resist liquid in the claimed range and that the viscosity is adjusted and determined based on the film uniformity and in accordance with the solid content of the resist material.

The difference between the claims and Raguin in view of Kitano is that Raguin in view of Kitano does not disclose that the viscosity is between one to about three centipoises.

Wilkinson, in col 3, lines 65-67, in col 4, lines 1-2, discloses that the photoresist solution to solvent ratio is about 3:1, and that the viscosity of the photoresist solution is about 1.3 centipoises.

Therefore, it would be obvious to a skilled artisan to modify Raguin by employing the suggestion of Kitano to vary the speed of the nozzle at various regions of the wafer (while scanning across the diameter of the wafer surface) because Kitano, in [0125], discloses that the moving speed or the scanning speed of the nozzle is varied in order to enable the adjustment of the film thickness for each region of the wafer making it possible to obtain a uniform resist film thickness. It would be obvious to a skilled artisan to modify Raguin by employing the method of adjusting the ratio of the resist content (solid) to the thinner (solvent) ratio, and the resultant viscosity as suggested by Kitano because Kitano, in [0157], and [0158], discloses that adjusting the solid content in the resist solution influences the resist viscosity which in turn can be adjusted in order to

maintain film thickness uniformity. It would be obvious to a skilled artisan to modify Raguin in view of Kitano by employing the photoresist solution of the claimed viscosity value as suggested by Wilkinson because Wilkinson teaches in col 4, lines 1-4, that the viscosity value of the coating photoresist solution is selected to as enable the formation of a film layer with uniform thickness across its entire surface.

6. Claim 3, is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of U. S. Patent Application Publication No. 2002/0088393 (Kitano et al., hereinafter referred to as Kitano) and U. S. Patent No. 4,422,904 (Wilkinson) as applied to claims 1-2, 4, 8-10, and 22-23 above, and further in view of U. S. Patent No. 3,637,384 (Deutsch et al., hereinafter referred to as Deutsch).

Raguin in view of Kitano and Wilkinson is discussed in paragraph no. 5.

The difference between the claims and Raguin in view of Kitano and Wilkinson is that Raguin in view of Kitano and Wilkinson does not disclose that the spray coating is performed in the claimed relative humidity (claim 3).

Deutsch, in col 6, lines 69-73, discloses that the photoresist coatings were formed in an environment under relative humidity conditions of less than 30 percent.

Therefore, it would be obvious to a skilled artisan to modify Raguin in view of Kitano and Wilkinson by employing the claimed relative humidity conditions as suggested by Deutsch because Raguin, in [0035], discloses the presence of vapor in the environment during the coating process, and Deutsch, in col 6, lines 44-75,

discloses the claimed conditions to be required in order to form photoresist compositions with improved development latitude.

7. Claims 11, 13-15, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of Research Disclosure (Kenneth Mason Publications, vol.324, April 1991, hereinafter referred to as RD91).

Raguin, in the abstract, in [0007], [0008], [0009], [0010], [0035], [0039], [0040], [0041], [0052], [0053], discloses rotating a substrate and spray coating at an angle to the surface of the substrate (see figure 6E) a positive-tone or a negative-tone photoresist solution the surface of the substrate (to obtain deep etched structures at least 15 μ , or greater than 50 μ), and moving the spray nozzle across the substrate surface (diameter) so as to ensure a thick photoresist film spread across the substrate surface uniformly. Raguin, in [0053], and in figure 6(e) discloses that the photoresist can be spray coated at an angle less than 90 degrees. Raguin, in [0033], discloses that the substrate is dried and cleaned (primed) with suitable solutions, solvents, acid solutions etc., so as to improve adhesiveness i.e., the surface is hydrophilic i.e., the surface has a contact angle less than 90 degrees (acute angle, less than 90 degree contact angle includes 40 – 50 degrees), followed by thorough drying prior to the spray coating of the photoresist solution. (claims 11, 13-15,).

The difference between the claims and Raguin is that Raguin does not disclose immersing the substrate in a solution, followed by rinsing in ultra pure wafer.

RD91, in the disclosure, teaches immersing (washing in a solution) followed by

thorough rinsing in wafer prior to priming (cleaning in acid) prior to resist lamination.

Therefore, it would be obvious to a skilled artisan to modify Raguin by employing the washing and water rinsing processes suggested by RD91 because RD91, discloses that doing so will prevent insufficient adhesion between the substrate and the photoresist layer to be laminated, and Raguin, in [0033], suggests thorough cleaning of the substrate so as to promote adhesion of the photosensitive material.

8. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of Research Disclosure (Kenneth Mason Publications, vol.324, April 1991, hereinafter referred to as RD91) as applied to claims 11, 13-15 above, and further in view of U. S. Patent No. 4,791,465 (Sakai et al., hereinafter referred to as Sakai).

Raguin in view of RD91 is discussed in paragraph no. 7.

The difference between the claims and Raguin in view of RD91 is that Raguin in view of RD91 does not disclose immersing the substrate in a peroxide-sulfuric solution for five to fifteen minutes and rinsing in ultra pure water for five to ten minutes (claim 12).

Sakai, in col 4, lines 39-56, discloses that the substrates are immersed in peroxide+sulfuric acid solution followed by a water rinsing process for several minutes.

Therefore, it would be obvious to a skilled artisan to modify Raguin in view of RD91 by employing the solution mixtures suggested by Sakai because Raguin, in [0033], discloses that solvents or solutions or acid solutions can be employed for

cleaning the substrate surface in order to promote adhesion of the surface with the photosensitive material and reduce the probability of defects caused by surface contamination.

9. Claim 16, is rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of Research Disclosure (Kenneth Mason Publications, vol.324, April 1991, hereinafter referred to as RD91) as applied to claims 11, 13-15 above and further in view of U. S. Patent No. 3,637,384 (Deutsch et al., hereinafter referred to as Deutsch).

Raguin in view of RD91 is discussed in paragraph no. 7.

The difference between the claims and Raguin in view of RD91 is that Raguin in view of RD91 does not disclose that the spray coating is performed in the claimed relative humidity (claim 16).

Deutsch, in col 6, lines 69-73, discloses that the photoresist coatings were formed in an environment under relative humidity conditions of less than 30 percent (less than 50 percent).

Therefore, it would be obvious to a skilled artisan to modify Raguin in view of RD91 by employing the claimed relative humidity conditions as suggested by Deutsch because Raguin, in [0035], discloses the presence of vapor in the environment during the coating process, and Deutsch, in col 6, lines 44-75, discloses the claimed conditions to be required in order to form photoresist compositions with improved development latitude.

10. Claim 17-18, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of Research Disclosure (Kenneth Mason Publications, vol.324, April 1991, hereinafter referred to as RD91) as applied to claims 11, 13-15 above and further in view of U. S. Patent Application Publication No. 2002/0088393 (Kitano et al., hereinafter referred to as Kitano).

Raguin in view of RD91 is discussed in paragraph no. 7.

Raguin, in the abstract, in [0007], [0008], [0009], [0010], [0035], [0039], [0040], [0041], [0052], [0053], discloses rotating a substrate and spray coating at an angle to the surface of the substrate (see figure 6E) a positive-tone or a negative-tone photoresist solution the surface of the substrate.

The difference between the claims and Raguin in view of RD91 is that Raguin in view of RD91 does not disclose the photoresist to solvent ratio (part of claims 17-18).

Kitano, in [0075], [0077], [0079, [0083], discloses that the ratio of the resist to the solvent (with at least 5% solid content) is varied to a range of values so as to keep the viscosity constant.

It would be obvious to a skilled artisan to modify Raguin by employing the method of adjusting the ratio of the resist content (solid) to the thinner (solvent) ratio, and the resultant viscosity as suggested by Kitano because Kitano, in [0157], and [0158], discloses that adjusting the solid content in the resist solution influences the resist viscosity which in turn can be adjusted in order to maintain film thickness uniformity.

11. Claims 19-21, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent Application Publication No. 2002/0182547 (Raguin) in view of U. S. Patent Application Publication No. 2002/0088393 (Kitano et al., hereinafter referred to as Kitano) and U. S. Patent No. 4,422,904 (Wilkinson) as applied to claims 1-2, 4, 8-10, 22-23, above and further in view of U. S. Patent Application Publication No. 2004/0185368 (Dammel et al., hereinafter referred to as Dammel).

Raguin in view of Kitano and Wilkinson is discussed in paragraph no. 5.

Raguin, in the abstract, in [0007], [0008], [0009], [0010], [0035], [0039], [0040], [0041], [0052], [0053], discloses rotating a substrate and spray coating at an angle to the surface of the substrate (see figure 6E) a positive-tone or a negative-tone photoresist solution the surface of the substrate.

The difference between the claims and Raguin in view of Kitano is that Raguin in view of Kitano does not disclose that the photoresist is a cyclohexanone-based resist (claim 20) and that the photoresist is a propylene glycol monomethyl ether acetate based resist (claim 21) and that the solvent is methyl-ethyl-ketone (claim 19).

Dammel, in [0034], discloses that the resist can be a propylene glycol monomethyl acetate based resist or a cyclohexanone based resists and that the solvent employed in the composition is ketone based solvent.

Therefore, it would be obvious to a skilled artisan to modify Raguin in view of Kitano and Wilkinson by employing the resist compositions suggested by Dammel because Raguin, in [0010], discloses using a photoresist material composition to form a layer of thickness greater than 50 μ , and Dammel, in [0028], [0035], and [0036],

discloses priming the substrate prior to spray coating the substrate with the claimed composition in order to promote adhesion of the thick photoresist layer with the surface of the substrate.

Response to Arguments

12. Applicant's arguments filed August 31, 2007, have been fully considered but they are not persuasive. Applicant's arguments, see Remarks, filed August 31, 2007, with respect to the rejection(s) of claim(s) 1-2, 5-7, 9-10 under 35 U. S. C. 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Wilkinson (see paragraph no. 5).

A) Applicants argue that neither Raguin nor Kitano discloses the claimed viscosity range

Neither Raguin nor Kitano is depended upon to disclose the claimed viscosity range. See paragraph no. 5.

B) Applicants argue that neither Raguin nor Kitano discloses the claimed photoresist to solvent ratio.

Raguin does teach adjusting the concentration by varying the photoresist to solvent concentration and thereby adjusting the viscosity of the resist to that of a lower value i.e., concentration of solvent greater than the photoresist material concentration. Kitano is depended upon to disclose the claimed ratio. Kitano, in [0138], [0139], and in [0160], and in figures 23, and 29, discloses that the viscosity of the resist liquid in the

claimed range and that the viscosity is adjusted and determined based on the film uniformity and in accordance with the solid content of the resist material.

C) Applicants argue that none of the references teach the claimed water contact angle and that the contact angle is not related to the spray angle.

The office action (paper no. 20070529) does not state nor indicate that the contact angle is the spray angle. Raguin teaches priming or cleaning the substrate surface with solutions so as to increase its adhesiveness prior to the photoresist coating process i.e., the surface of the substrate is rendered hydrophilic, therefore the contact angle of the primed surface of the substrate will be acute.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you

Application/Control Number:
10/680,960
Art Unit: 1795

Page 13

have questions on access to the Private PAIR system, contact the Electronic Business
Center (EBC) at 866-217-9197 (toll-free).

dcd

A handwritten signature in black ink, reading "Mark Charles Davis", written over a horizontal line.

November 13, 2007.